

(c) an integral threaded stem for capturing the backup diaphragm on the non wetted side of the primary diaphragm directly to a threaded drive shaft for positioning said diaphragms for the regulation of the fluid flow rate.

(d) an integral rectangular cross section rim machined at the periphery of the diaphragms for the purpose of providing a fluid seal without the need for o-rings or new wetted materials.

(e) a construction of tandem diaphragms such that one backs up the other and both may be positioned synchronously by an attached threaded drive shaft

4. a construction of tandem diaphragms in a throttling valve including a weep hole bored into the space in between the two diaphragms providing for the detection of a leak in the primary diaphragm.

5. A drive shaft providing direct coupling from a rotor to the positioning of the diaphragms of a throttling valve where one of the diaphragms interfaces to the process fluid and controls the restriction to the flow path of said fluid comprising.

(a) Corrosion resistant material.

(b) flat sections machined on either side to prevent the unwanted rotation of the drive shaft relative to the captured diaphragms.

(c) a construction of tandem diaphragms and metallic drive shaft for positioning said diaphragms relative to a mating surface.

6. A screw drive mechanism for translating rotational to linear motion in a throttling valve using a large diameter rotor for carrying comparatively large axial loads comprising

(a) self lubricating materials minimizing wear and galling of the threaded drive shaft and rotor interface.

(b) a gap in the threads to provide a capture space for lubricant when lubrication is needed to protect the threads beyond the natural self lubricating characteristics of the material.

(c) a set of thrust bearings maintaining the rotor in a state of free rotation isolated from the vertical load carried by the bearings.

(d) a wavy spring providing a vertical pre load on the rotor such that there will be a constant direction load carried in the threads of the rotor for all anticipated process fluid pressures.

7. A general compact construction such that a fluid control valve drive mechanism maybe disassembled leaving the diaphragms intact as described in **claim 1** and inspected with out the need to remove or depressurize the process fluid.

8. A construction comprising a contoured discharge port on the valve body within the fluid cavity matching the contour of the diaphragm and integral throttling surface within a throttling valve. The matching contours are substantially flat and perpendicular to the direction of displacement so that if the motor should over run in the close, or full open direction the throttling surfaces will bottom out and not deform or otherwise get stuck in the closed, or open positions.

ABSTRACT

A throttling valve assembly actuated by a stepper motor having a double diaphragm seal and integral throttling surface. The throttling surface interfaces to a mating orifice and port arrangement to provide a smooth control regime for various process fluids. Because of the unique design of the flow paths the fluids will remain in a laminar flow state throughout the throttling range, thus providing smooth and continuous response to the control input. The valve opening to the fluid controlled by a stepper motor through a direct drive mechanism. The embodiment shown here employees all PTFE construction for the wetting parts, but any material could be used that would be compatible with the process fluid. Additional features are minimal capture of the process fluid, free draining, and no metallic parts in close communication with the process fluid.